Chapter Two:
Assessment of Resources

Chapter Two provides a detailed analysis of the District's important water and land resources. Included in this Chapter are sections on water quality and quantity, invasive aquatic species, soils, and land use. Collectively, this information will be used to identify the priority issues of each of the District's ten subwatersheds in Chapter Three.

A. Water Resources

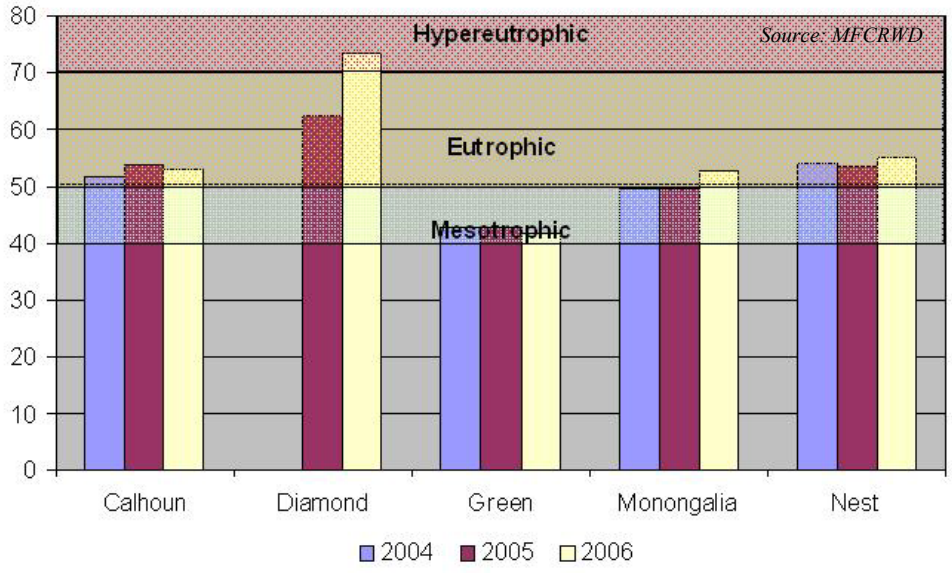
Surface Water Quality

Several efforts have been undertaken to monitor the quality of lakes and streams in the District, starting as early as 1946. The most extensive of these efforts were recently undertaken as part of the CWPs that were completed for the Middle Fork Crow River (upstream of CSAH 2) and Diamond Lake. Entities that have been involved in monitoring include the District, lake associations, CROW, DNR, MPCA, and EPA. The following provides an overview on surface water quality in the District.

Lakes

The Trophic State Index (TSI) is one of the most commonly used methods of assessing overall lake health. The TSI quantifies lake fertility/productivity on a scale from 0 (oligotrophic) to 100 (hypereutrophic) based upon Secchi disk readings and concentrations of total phosphorous and chlorophyll-a. Definitions for each of the TSI lake classifications are provided on the next page. The mean TSI values (2004-2006) for lakes in the District are presented in Figure 2A. Notice that Diamond Lake was the most eutrophic of these lakes. Calhoun, Monongalia, and Nest Lakes were also classified as eutrophic, but were only slightly above the mesotrophic threshold. Green Lake was categorized as mesotrophic, although it barely exceeded the oligotrophic criteria. Though not shown in this Figure, Elkhorn, George, and Long Lakes would also be classified as mesotrophic.

Figure 2A
Mean TSI Values for Lakes (2004-2006)



TSI Lake Classifications:

Oligotrophic (TSI <40). These are nutrient poor lakes with low productivity. They are characterized by high transparency and low concentrations of chlorophyll-a and total phosphorus.

Mesotrophic (TSI 40-50). Lakes in this class are moderately productive with intermediate transparency and chlorophyll-a and total phosphorus concentrations.

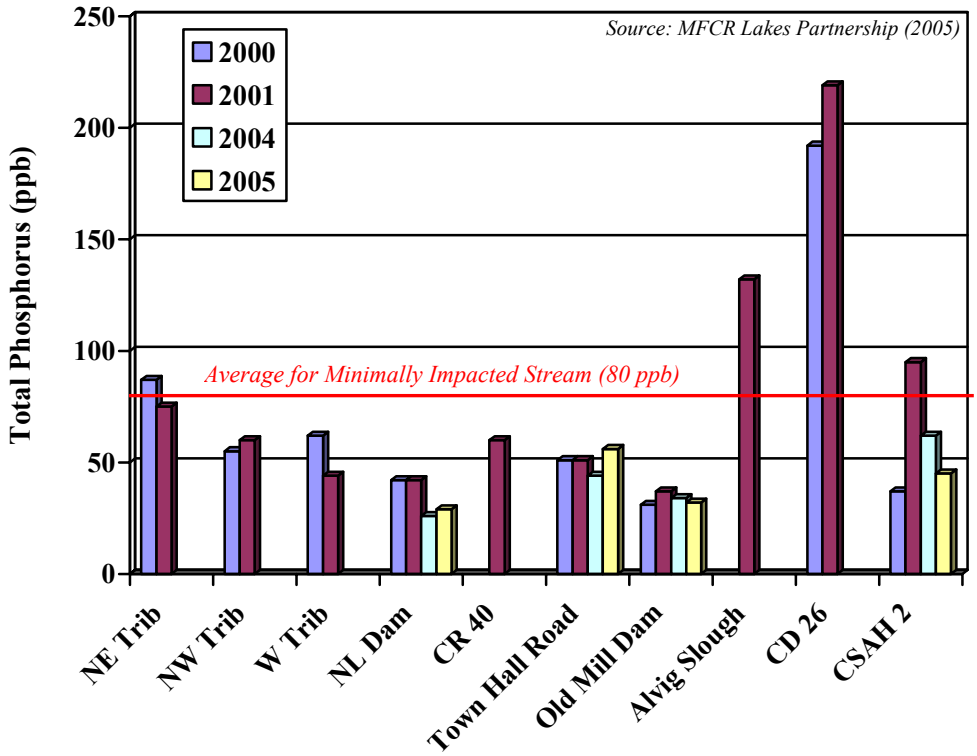
Eutrophic (TSI 50-70). These are very productive and fertile lakes. They have low transparency with high chlorophyll-a and total phosphorus concentrations.

Hypereutrophic (TSI >70). These are the most productive and nutrient rich lakes. They are characterized by very poor transparency and extremely high chlorophyll-a and total phosphorus concentrations.

Streams

Phosphorus is the major pollutant of concern for streams in the District. Figure 2B displays total phosphorus monitoring results for samples collected as part of the Middle Fork Crow River CWP and Lakes Partnership. Alvig Slough and County Ditch 26 are the largest contributors of phosphorus in the District (TP>132 ppb). Generally, the other sampling points had total phosphorus concentrations near or below the average for minimally impacted streams in the North Central Hardwood Forests Ecoregion, as determined by the MPCA from water quality data collected between 1986 and 1992. It is important to note that this graphic does not include data for the heavily agricultural, eastern portion of the District.

Figure 2B
Flow-Weighted Mean Total Phosphorus Concentrations of Streams



Water Quality Monitoring

A complete listing of primary lake and stream monitoring sites in the District, along with an inventory of the data that exists for each site, is provided in Table 2A. The location of these sites is shown in Map 2A. In addition, a number of secondary monitoring sites, mainly grab-sample locations, exist in the District. Generally, the results from these secondary sites have not been compiled into a formal database.

Major Water Quality Parameter Definitions:

Chl - Chlorophyll a (μg/l). Photosynthetic pigment found in all green plants and the main pigment in algae. The concentration of chlorophyll-a is used to estimate the amount of algae (all phytoplankton in a given area) in surface water.

DO - Dissolved Oxygen (mg/l). Microbial communities in water use dissolved oxygen to breakdown organic materials, such as manure, sewage, and decomposing algae. Low levels of dissolved oxygen can be a sign that too much organic material is in a waterbody.

NOx - Nitrogen Oxides (mg/l). Nitrogen oxides include various nitrogen compounds including nitrate (NO_3) and nitrite (NO_2).

OP - Ortho-Phosphate (mg/l). The form of phosphorus that is readily available to plants. More complex polyphosphates break down to this form.

pH - pH Scale. A measurement of the hydrogen ion concentration in a solution, with 7 being neutral. Values below 7 are acidic, while values above 7 are alkaline.

SD - Secchi Depth (m). The depth in a lake to which a Secchi disk can be observed, as a measure of light penetration in water. The disk is lowered into a section of water until it can no longer be seen and then lifted back up until it can be seen once again; the two depths are then averaged.

ST – Stream Transparency (cm). The clarity of stream water, as measured by a transparency tube. To measure water clarity, the tube is filled with water collected from a stream or river. Looking down into the tube, water is released through a valve until the colored disk is visible and the value is recorded.

TA - Total Alkalinity (mg/l). A measure of the acid neutralizing capacity of water, as indicated by the presence of carbonate, bicarbonates, or hydroxides.

Temp - Temperature (°C). A specific degree of hotness or coldness as indicated on or referred to a standard scale.

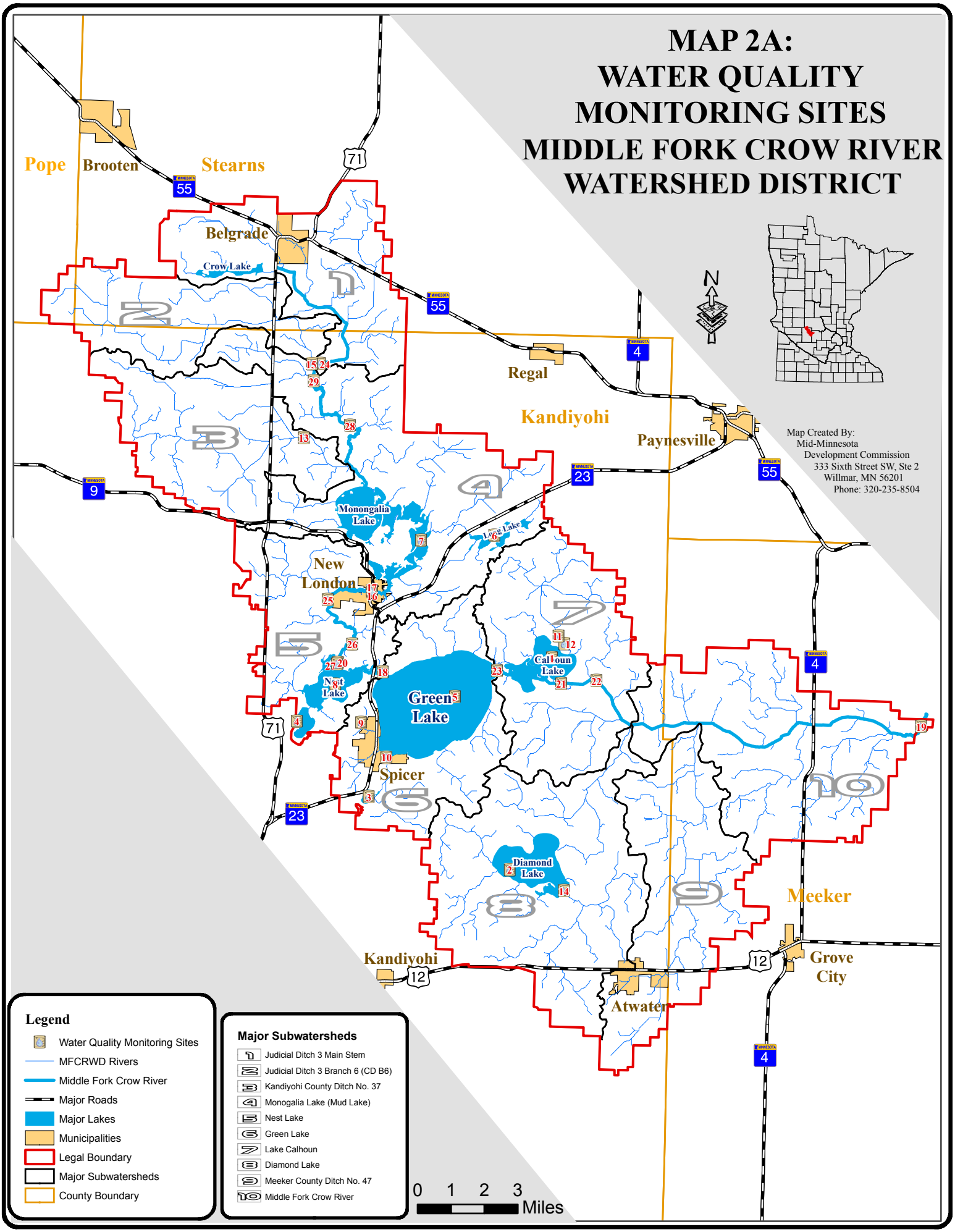
TKN - Total Kjeldahl Nitrogen (mg/l). The sum of organic and inorganic nitrogen in a waterbody.

TP - Total Phosphorus (mg/l). A nutrient essential to the growth of organisms, and is commonly the limiting factor in the primary productivity of surface waterbodies. Total phosphorus includes the amount of phosphorus in solution (reactive) and in particle form.

TSS - Total Suspended Solids (mg/l). A measure of the material suspended in a waterbody. Total suspended solids cause: a) interference with light penetration, b) buildup of sediment, and c) reduction in aquatic habitat.

Table 2A
Primary Lake Water Quality Monitoring Sites

Map ID	Site Location (ID)	Date(s)	Agency(s)	Available Water Quality Data *(Data is not necessarily available for all years)*
1	Calhoun Lake (34-0062)	1987-2006	CWP, DNR, MFCRWD, MPCA	Chl, DO, NOx, OP, pH, SD, TA, Temp, TKN, TP, TSS
2	Diamond Lake (34-0044)	1975-2006	MPCA	Chl, DO, NOx, pH, SD, TA, Temp, TKN, TP, TSS
3	Elkhorn Lake (34-0119)	1960-2000	CWP, DNR	Chl, DO, NOx, pH, SD, TA, Temp, TKN, TP, TSS
4	George Lake (34-0142)	1950-2006	CWP, DNR, MPCA	Chl, DO, NOx, pH, SD, TA, Temp, TKN, TP, TSS
5	Green Lake (34-0079)	1946-2006	CWP, DNR, EPA, MDH, MFCRWD, MPCA	Chl, DO, NOx, OP, pH, SD, TA, Temp, TKN, TP, TSS
6	Long Lake (34-0066)	1955-2006	CWP, DNR, MPCA	Chl, DO, NOx, pH, SD, TA, Temp, TKN, TP, TSS
7	Monongalia Lake (34-0158)	1950-2006	CWP, DNR, MFCRWD, MPCA, USFWS	Chl, DO, NOx, OP, pH, SD, TA, Temp, TKN, TP, TSS
8	Nest Lake (34-0154)	1954-2006	CWP, DNR, EPA, MFCRWD, MPCA	Chl, DO, NOx, OP, pH, SD, TA, Temp, TKN, TP, TSS
9	Woodcock Lake (34-0141)	1972	EPA	DO, SD, Temp, TP
10	Alvig Slough inlet to Green Lake	1968-2006	CWP, MFCRWD, MPCA	DO, NOx, OP, pH, TA, Temp, TKN, TP, TSS
11	County Ditch 26 above Calhoun Lake	1996-2006	CWP, MFCRWD, MPCA	DO, NOx, OP, pH, TA, Temp, TKN, TP, TSS
12	County Ditch 26 at CSAH 130	2002-2005	MPCA	ST
13	County Ditch 37 at 55th Street NE	1972-2001	CWP, MPCA	DO, NOx, OP, pH, TA, Temp, TKN, TP, TSS
14	Hubbard Lake inlet to Diamond Lake	2001-2006	CWP, MFCRWD	Chl, TP, TSS
15	Judicial Ditch 3, Branch 6 at CSAH 35	1972-2001	CWP	NOx, TKN, TP, TSS
16	MFCR above New London Dam	1950-2006	CWP, DNR, MFCRWD, MPCA, USFWS	DO, NOx, OP, pH, TA, Temp, TKN, TP, TSS
17	MFCR below New London Dam	2000-2006	MFCRWD, MPCA	NOx, OP, TKN, TP, TSS
18	MFCR inlet to Green Lake	1968-2006	CWP, DNR, EPA, MFCRWD, MPCA	DO, NOx, OP, pH, ST, TA, Temp, TKN, TP, TSS
19	MFCR at Manannah	2001-2006	CWP, MFCRWD	DO, OP, pH, Temp, TP, TSS
20	MFCR inlet to Nest Lake	2000-2001	CWP	NOx, TKN, TP, TSS
21	MFCR at CR 138 Bridge	2000	MPCA	ST
22	MFCR at CSAH 2	1961-2006	CWP, DNR, MFCRWD, MPCA, USGS	DO, NOx, OP, pH, ST, TA, Temp, TKN, TP, TSS
23	MFCR at CSAH 4 Bridge	1968-2001	LA, MPCA	DO, NOx, OP, pH, TA, Temp, TKN, TP, TSS
24	MFCR at CSAH 35	1972-2001	CWP, MPCA	DO, NOx, OP, pH, TA, Temp, TKN, TP, TSS
25	MFCR at CSAH 40	1972-2006	CWP, EPA, MFCRWD, MPCA	DO, NOx, OP, pH, TA, Temp, TKN, TP, TSS
26	MFCR at TR 211	1972-2006	CWP, MFCRWD, USFWS	DO, NOx, OP, pH, TA, Temp, TKN, TP, TSS
27	MFCR at 66th Street NE	2000	MPCA	ST
28	MFCR at 255 Avenue NE	2001	CWP, MPCA	NOx, OP, TA, TKN, TP, TSS
29	MFCR at 275 Avenue	2006	MFCRWD	OP, TP, TSS


MAP 2A:
WATER QUALITY
MONITORING SITES
MIDDLE FORK CROW RIVER
WATERSHED DISTRICT
Pope
Brooten
Stearns
Belgrade
Crow Lake
Regal
Kandiyohi
Paynesville
Monongalia Lake
Lost Lake
New London
Nest Lake
Green Lake
Spicer
Calhoun Lake
Diamond Lake
Meeker
Kandiyohi
Grove City
Atwater
Map Created By:
Mid-Minnesota
Development Commission
333 Sixth Street SW, Ste 2
Willmar, MN 56201
Phone: 320-235-8504
Legend
Water Quality Monitoring Sites
MFCRWD Rivers
Middle Fork Crow River
Major Roads
Major Lakes
Municipalities
Legal Boundary
Major Subwatersheds
County Boundary
Major Subwatersheds
Judicial Ditch 3 Main Stem
Judicial Ditch 3 Branch 6 (CD B6)
Kandiyohi County Ditch No. 37
Monogalia Lake (Mud Lake)
Nest Lake
Green Lake
Lake Calhoun
Diamond Lake
Meeker County Ditch No. 47
Middle Fork Crow River
0 1 2 3
Miles

Impaired Waters

The Federal Clean Water Act requires States to adopt water quality standards to protect the nation's waters. These standards define how much of a pollutant can be in surface and/or groundwater, while still allowing the water to meet its designated uses, such as drinking, fishing, swimming, or irrigation. Minnesota's statewide water quality standards and other provisions that protect water quality are found in MN Rules Chapter 7050.

Section 303(d) of the Clean Water Act requires States to publish, every two years, an updated list of lakes and streams that are not meeting their designated uses because of pollutants. The list, referred to as the List of Impaired Waters, is based on violations of State water quality standards. For each pollutant that causes a waterbody or watercourse to fail to meet water quality standards, the Clean Water Act requires the State to conduct a Total Maximum Daily Load (TMDL) study, which identifies all point and nonpoint sources. Water quality sampling and computer modeling determine how much each pollutant source must reduce its contributions to assure the standard is met. Lakes and streams may have several TMDLs, each determining the limit for a different pollutant. It is very important to note that the absence of a waterbody or watercourse from the List does not necessarily mean that it is meeting its designated uses. It may be that the waterbody or watercourse has either not been sampled or there is not enough data to make an impairment determination.

According to Table 2B, seven lakes in the District were included on the 2006 Section 303(d) List of Impaired Waters. All of these lakes were listed as impaired because of mercury fish consumption advisories (FCA). In addition, Diamond Lake was included on the List because of excess nutrients, which affects aquatic recreation. Nest Lake was nearly listed for the same reason. The TMDL study requirement for mercury-impaired lakes will be addressed through a statewide study that was prepared by the MPCA and submitted to the EPA in August 2006 for review and approval. The nutrient impairment for Diamond Lake will require an individual TMDL study. Also, the Lake Pepin TMDL will impact the District, along with the entire Upper Mississippi River Basin. Lake Pepin was listed as impaired for turbidity and excess nutrients; the larger Crow River Watershed is the largest contributor of nutrients to the Lake in the Upper Mississippi River Basin.

Table 2B
2006 Section 303(d) List of Impaired Waters

Lake (DNR ID)		Affect Use	Pollutant	TMDL Study Dates (MPCA)	
				Start	Completion
Calhoun	(34-0062)	Aquatic consumption	Mercury FCA	2006	2021
Diamond	(34-0044)	Aquatic consumption	Mercury FCA	1999	2011
Diamond	(34-0044)	Aquatic recreation	Excess Nutrients	2015	2019
George	(34-0142)	Aquatic consumption	Mercury FCA	2002	2015
Green	(34-0079)	Aquatic consumption	Mercury FCA	1999	2011
Long	(34-0066)	Aquatic consumption	Mercury FCA	2006	2021
Mud	(34-0158)	Aquatic consumption	Mercury FCA	2006	2021
Nest	(34-0154)	Aquatic consumption	Mercury FCA	1999	2011

Surface Water Quantity

Lakes

The DNR routinely monitors the water level of lakes throughout the State. A summary of the historical record of lakes monitored by the DNR, with assistance from lake associations and the Kandiyohi County Public Works Department, in the District is provided in Table 2C. The majority of lakes have an extensive record; the record of seven of the lakes date back to the 1940s. The level of most lakes has remained relatively stable. This can be attributed to the fact the level of most lakes is controlled by a dam. Only Elkhorn Lake has fluctuated greater than ten feet.

Table 2C
Historical Lake Levels

Lake (DNR ID)	Period of Record	# of Readings	Historical Elevations (ft)		
			Mean	High (Year)	Low (Year)
Calhoun (34-0062)	1949-2006	803	1,156.09	1,157.72 (1986)	1,153.87 (1949)
Diamond (34-0044)	1949-2005	447	1,172.19	1,173.46 (1984)	1,169.51 (1989)
Elkhorn (34-0119)	1941-2006	352	1,167.49	1,169.91 (1991)	1,157.49 (1941)
George (34-0142)	1948-2006	359	1,165.39	1,166.81 (1969)	1,162.93 (1989)
Green (34-0079)	1938-2006	1,579	1,156.31	1,158.79 (1986)	1,153.88 (1976)
Long (34-0066)	1977-2006	455	1,209.63	1,210.37 (2004)	1,208.68 (1988)
Mud (34-0158)	1945-2006	3,711	1,203.51	1,205.42 (1991)	1,198.10 (1945)
Nest (34-0154)	1940-2006	888	1,165.37	1,166.72 (1986)	1,162.76 (1976)

Streams

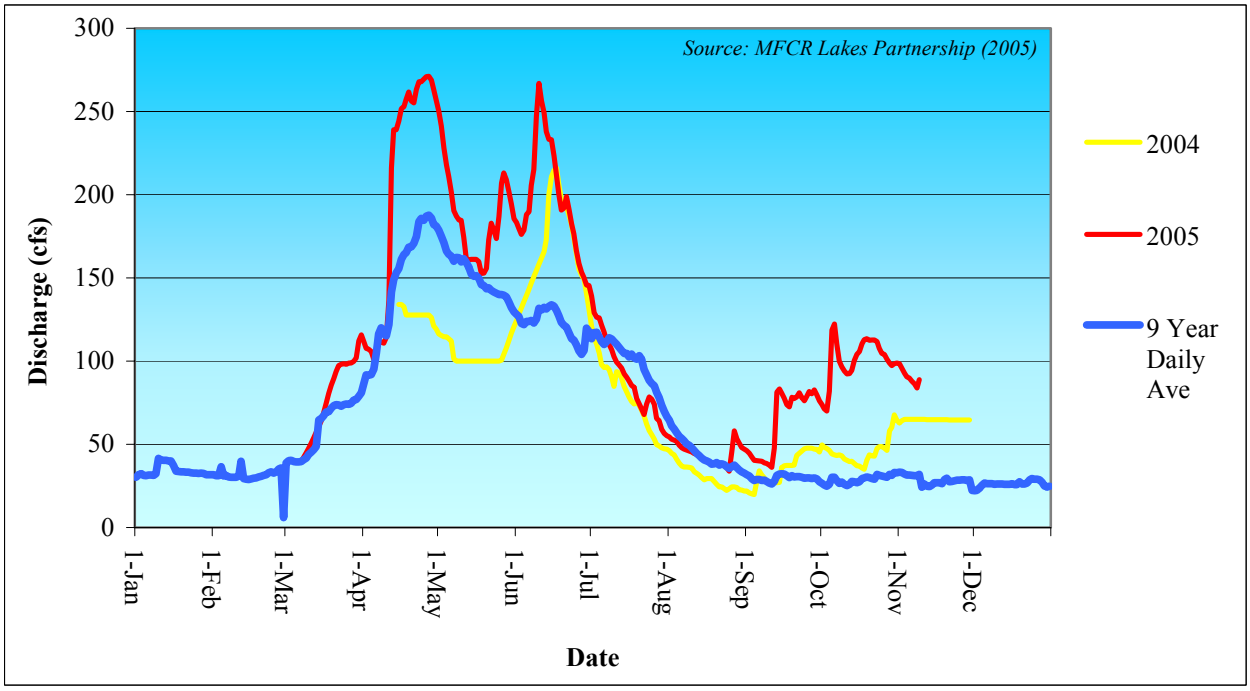
The USGS established a continuous flow monitoring station on the River near CSAH 2 in March 1949. The station has been primarily operated by the USGS; however, several other entities have been involved in flow monitoring, including the DNR, Kandiyohi County, lake associations, and most recently, the District. Data collected from this station is available real-time from the USGS website (http://waterdata.usgs.gov/nwis/nwisman/?site_no=05278000&agency_cd=USGS). The approved mean daily flow values (1949-1987) for the station are provided in Table 2D. Notice that flows begin to increase substantially during the early spring (mid-March) as a result of snowmelt and increased precipitation, eventually peaking in late April to early May. Flows steadily diminish throughout the summer, ultimately reaching baseflow conditions in September. The overall average flow for the station during this period was 66 cfs.

Table 2D
Approved Mean Daily Flow Values (cfs) for USGS Station #05278000 (1949-1987)

Day	Month											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	35	30	37	78	140	117	111	66	45	43	43	44
2	35	30	37	79	139	113	109	65	44	43	43	44
3	35	30	37	83	137	111	107	64	46	43	43	45
4	35	30	38	84	135	109	104	64	46	42	43	45
5	35	30	39	87	134	109	101	62	45	42	43	45
6	34	30	40	91	134	110	99	60	44	42	43	45
7	34	30	41	94	135	110	98	59	43	41	43	45
8	35	30	41	99	136	110	98	59	42	41	43	44
9	34	31	41	102	137	108	95	59	44	40	42	43
10	34	31	42	107	135	106	92	59	45	40	43	42
11	34	31	43	108	134	105	90	58	44	40	42	42
12	33	31	45	110	132	104	92	57	45	40	43	42
13	33	31	48	114	132	102	95	56	44	41	42	41
14	33	31	48	118	132	103	92	57	44	41	43	41
15	33	31	50	119	133	105	88	57	43	42	43	41
16	32	32	52	121	133	107	84	55	43	43	42	41
17	32	33	53	122	131	112	82	54	44	44	43	40
18	31	33	55	120	129	112	80	52	43	44	44	40
19	31	34	58	120	127	110	81	51	45	45	43	39
20	31	35	58	121	125	110	80	50	45	45	44	39
21	31	36	60	125	127	117	78	50	45	44	44	38
22	31	36	60	128	128	120	76	49	44	44	45	38
23	31	36	62	129	128	116	74	48	44	44	44	37
24	30	37	64	132	127	114	74	47	44	43	45	37
25	30	36	66	133	127	112	74	46	44	42	45	37
26	30	37	68	133	127	113	72	52	43	42	44	37
27	30	37	70	135	127	111	72	52	43	42	44	37
28	30	38	72	139	126	110	71	49	42	43	45	36
29	30	44	74	140	126	112	69	48	41	42	44	36
30	30		77	140	124	113	68	47	42	42	44	36
31	30		78		121		68	46		43		36

The mean daily flow (2004-2005) for the River at CSAH 2 is shown in Figure 2C. Based on the estimated annual runoff measured at the CSAH 2 gaging station, nearly 79,791 acre feet (26 billion gallons) of water flowed through the Watershed in 2005. This is enough water to replace 70% of the volume of Green Lake. Overall, this demonstrates the importance of runoff to the hydrologic budget and overall quality of lakes.

Figure 2C
Middle Fork Crow River at CSAH 2 Mean Daily Flow (2004-2005)



Several other stream gaging stations have been operated in the District as part of the Middle Fork Crow River CWP and Lakes Partnership. A combined hydrograph (2004-2005) for these stations, including the CSAH 2 station, is provided in Appendix A (Figure 2). The highest flows for each of the sites were recorded in April of 2005. The New London dam provided the highest measured flow, with a discharge of 362 cubic feet per second (cfs) on April 18, 2005. It is also interesting to note that the peak flows in the fall of 2005 were comparable to the 2004 spring runoff volumes. This occurrence resulted in increased phosphorus concentrations in Green and Calhoun Lakes, as nutrients were exported from Nest Lake.

Additional historical flow data for the CSAH 2 station and New London Dam have been incorporated in to Appendix A (Tables 1 and 2).

Groundwater Quality

Chemically, the groundwater of the District is of the calcium-magnesium bicarbonate type, with high concentrations of iron and manganese present in many areas. Generally, the groundwater is suitable for most purposes; however, hardness is often a problem.

Groundwater Contamination

Groundwater contamination is a significant concern in many areas of the District, especially those areas with unconfined aquifers (i.e. Belgrade Area). Potential pollution sources include noncompliant septic systems, agricultural operations (fertilizers and pesticides), and chemical contamination from landfills, storage tanks, spills, and other similar activities. A major pollutant of concern is nitrate-nitrogen. This pollutant is highly soluble and in excessive amounts can cause methemoglobinemia, also known as "blue baby syndrome". The MDH recently developed a nitrate-nitrogen probability map for Stearns County. The Belgrade Area was classified as an area with a high probability of having elevated nitrate concentrations.

Wellhead Protection

The Minnesota Groundwater Protection Act of 1989 requires the MDH to develop wellhead protection measures for wells serving public water supplies. Wellhead protection is a means of protecting public water supply wells by preventing contaminants from entering the area that contributes water to the well or well field over a period of time. The wellhead protection area is determined by using geologic and hydrologic criteria, such as the physical characteristics of the aquifer and the effects which pumping has on the rate and direction of groundwater movement. A management plan is developed for the wellhead protection area that includes inventorying potential sources of groundwater contamination, monitoring for the presence of specific contaminants, and managing existing and future land and water uses that pose a threat to groundwater quality.

There are three public water suppliers in the District: the Cities of Atwater and Belgrade and the Green Lake Sanitary Sewer and Water District (GLSSWD). Currently, these suppliers are not enrolled in the MDH's Wellhead Protection Program, but will be phased in over time. Based upon existing source water assessments that have been prepared for these suppliers, the City of Atwater's wells are considered to be highly sensitive to groundwater contamination because of the surficial geology of the area, while one of the City of Belgrade's wells is deemed sensitive to pollution because of its construction. The water supply wells of GLSSWD are classified as having a low sensitivity to contamination.

Groundwater Quantity

The DNR is responsible for regulating ground and surface water appropriations in the State. A water appropriation permit is required for withdrawals greater than 10,000 gallons per day or one million gallons per year (MGY). There are several exemptions from the permit requirement including domestic uses serving less than 25 persons for general residential purposes, test pumping, and reuse of water already authorized by a permit. All active water appropriation permit holders are required to measure monthly water use with an approved measuring device, to an accuracy of 10 percent, and report water use yearly.

A summary of the active water appropriation permits in the District is provided in Table 2E. The majority of permits have been used for groundwater withdrawals (199), with lesser amounts for streams/rivers (4), gravel pits (3), dug pits (2), and ditches (1). Crop production is the largest groundwater use, with an average withdrawal of 1,895.4 MGY between 1988 and 2005. This value was notable lower than total permitted withdrawal, which was 8,344.5 MGY.

Table 2E
Water Appropriations

Source	Use Type	Appropriations (#)	Withdrawal (MGY)	
			Average (1988-2005)	Permitted
Groundwater	Crop Production	168	1,748.5	6800.8
	Livestock	13	0.4	216.0
	Municipal	9	116.6	705.0
	Golf Course	3	21.1	148.0
	Aquaculture	3	6.2	230.0
	Landscaping	1	2.4	7.1
	Orchard	1	0.2	1.6
	Ethanol	1	0.0	236.0
	Total	*199*	*1,895.4*	*8,344.5*
Streams/Rivers	Aquaculture	2	472.5	603.0
	Aggregate Washing	1	2.5	44.4
	Crop Production	1	0.0	13.3
	Total	*4*	*475.0*	*660.7*
Gravel Pits	Aggregate Washing	2	43.9	53.0
	Dewatering	1	5.9	20.0
	Total	*3*	*49.8*	*73.0*
Dug Pits	Golf Course	2	8.3	82.2
Ditches	Crop Production	1	1.4	13.3

Water Resource Issues

Wetlands Preservation/Restoration

Preservation of wetlands is primarily accomplished through a combination of regulatory and conservation easement programs. Regulatory programs include the Wetland Conservation Act (WCA), Protected Waters Inventory, Swampbuster, and Section 404 of the Clean Water Act. Notable conservation easement programs include Reinvest in Minnesota, Wetland Reserve Program, and USFWS programs. Many of these easement programs also offer financial incentives for wetland restoration. Several wetland restoration projects have occurred in the District, including restoration of Timber Lake (a 308 acre drained lake), a MnDOT wetland mitigation project, and two wetland mitigation bank projects in Kandiyohi County. The recent completion of restorable wetlands inventories for Kandiyohi, Pope, and Stearns Counties will allow agencies to better focus future efforts. The following profiles each of the regulatory and conservation easement programs.

Wetland Regulations

Wetlands Conservation Act

In 1991, the Minnesota Legislature passed the Wetlands Conservation Act (WCA), which created a statewide "no-net loss" policy for wetlands. The law requires anyone proposing to drain or fill a wetland, first to attempt to avoid disturbing the wetland; second, to attempt to minimize any impact on the wetland; and, finally, to replace any lost wetland acres, functions, and values. Certain wetland activities are exempt from the Act, allowing projects with minimal impact or projects located on land where certain pre-established land uses are present to proceed without regulation. Counties and/or SWCDs often implement the act locally. The BWSR administers the WCA at the State level and the DNR provides enforcement.

Public Waters Inventory

For regulatory purposes, Minnesota has grouped its waters into two categories: public waters and public water wetlands. Public waters are all waterbasins and watercourses that meet the criteria set forth in Minnesota Statutes, Section 103G.005, subd. 15 that are identified on Public Water Inventory maps and lists authorized by Minnesota Statutes, Section 103G.201. Public water wetlands include all Type 3, 4, and 5 wetlands (as defined in U.S. Fish and Wildlife Service Circular No. 39, 1971 edition) that are 10 acres or more in size in unincorporated areas or 2 ½ acres or more in size in incorporated areas (see Minnesota Statutes Section 103G.005, subd. 17b, Wetland Type). The county-scale maps that show the general location of public waters and public water wetlands are commonly known as Public Waters Inventory (PWI) maps. The regulatory "boundary" of these waters and wetlands is referred to as the ordinary high water level (OHWL). Excavation, filling, and other work done below the OHWL generally requires a DNR Public Waters Work Permit.

Swampbuster

The Wetland Conservation provision (Swampbuster) of the 1985 Natural Food Security Act and its subsequent amendment grants the NRCS the primary authority over wetlands related to agricultural lands. Swampbuster requires all agricultural producers to protect the wetlands on the farms they own or operate as a stipulation of eligibility for USDA farm program benefits. Producers are not eligible to receive these benefits if they plant an agricultural commodity on a wetland that was converted by drainage, leveling, or any other means after December 23, 1985, or convert a wetland for the purpose of, or to make agricultural commodity production possible after November 28, 1990.

The NRCS categorizes wetlands according to Swampbuster applicability. There are four categories of wetlands subject to Swampbuster restrictions and three categories of wetlands with Swampbuster exemptions. Each wetland classification includes its own unique set of regulatory requirements. The following describes each of the NRCS wetland categories:

Regulated Wetland Categories

Wetlands (W) - Areas meeting wetland criteria under natural conditions that have typically not been manipulated by altering hydrology and/or removing woody vegetation.

Farmed Wetlands (FW) - Wetlands that were drained, dredged, filled, leveled, or otherwise manipulated before December 23, 1985, for the purpose of making the production of an agricultural commodity possible, and continue to meet specific wetland criteria. Under this category drainage may be maintained but not improved.

Farmed Wetland Pasture or Hayland (FWP) - Wetlands manipulated and used for pasture or hayland, including native pasture and hayland, prior to December 23, 1985 that still meet specific wetland hydrology criteria and are not abandoned; or were in agricultural use and met FWP criteria on December 23, 1985.

Converted Wetland (CW) - Wetlands drained, dredged, filled, leveled, or otherwise manipulated for the purpose of, or to have the effect of, making possible the production of an agricultural commodity. These lands must have been W, FW, or FWP and not highly erodible prior to the conversion. They may have been converted by any activity, including the removal of woody vegetation, that impaired or reduced the flow, circulation, or reach of water; provided the conversion activity was such that agricultural production on the land would not have been possible without its application.

Exempted Wetland Categories

Prior Converted Cropland (PC) - Converted wetlands where the conversion occurred prior to December 23, 1985; an agricultural commodity had been produced at least once before December 23, 1985; and as of December 23, 1985, the converted wetland met certain specific hydrologic criteria and did not support woody vegetation.

Artificial and Irrigation-Induced Wetland (AW) - Wetlands in an area that was formerly non-wetland, but now meets wetland criteria due to human activities. This definition includes wetlands created by an irrigation system on an area that was formerly non-wetland.

Non-Wetland (NW) - Land that under natural conditions does not meet wetland criteria. This definition includes wetlands which were converted to the extent that wetland criteria was not present prior to December 23, 1985, but were not cropped.

U.S. Army Corps of Engineers, Section 404

Section 404 of the Clean Water Act (33 U.S.C. 1344) prohibits discharge of dredged or fill material into waters of the United States without a permit from the USACE. Waters of the United States include wetlands and tributaries adjacent to navigable waters and other waters where the degradation or destruction of which could affect interstate or foreign commerce. If a project involves discharge of dredged or filled material, the Corps will evaluate the proposed activity under the Section 404 guidelines prepared by the EPA.

The USACE and the EPA define wetlands as areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Activities in wetlands that normally require permits include, but are not limited to the list below:

- Placement of fill material
- Ditching activities when excavated materials is side cast
- Levee and dike construction
- Land clearing involving relocation of soil material
- Land leveling
- Most road construction
- Dam construction

The Corp of Engineers must consider the following Federal laws during permit review:

- National Environmental Policy Act
- Fish and Wildlife Coordination Act
- Endangered Species Act
- National Historic Preservation Act
- Federal Power Act
- Wild and Scenic Rivers Act
- National Fishing Enhancement Act of 1984

The Corps of Engineers uses four different types of review processes depending upon the nature of the work proposed:

Letter of Permission - This is used for minor non-controversial projects in navigable waters of the United States, and concerns docks and small dredging projects.

Nation Wide General Permit - This permit is a blanket authorization for activities that will have minimal environmental effects such as navigational aids, fill for minor road crossings, certain outfall structures, discharges into certain waters, bank stabilization, and fill for utility lines.

Regional General Permit - This permit authorizes certain projects in Minnesota where a DNR permit is usually required, and includes projects including larger bank stabilization projects, bridge and culvert replacements, sand blankets, dredging and rough fish barriers.

Full Public Interest Review - This is required for large projects such as new marinas or harbors in navigable waterways, large dredging projects, highway projects through wetlands or waters, fill in wetlands to convert them to upland, and large drainage projects.

Wetland Restoration/Protection Programs

Wetland Reserve Program (Perpetual/ Limited)

The Wetland Reserve Program (WRP) is a voluntary program through the USDA to restore and protect wetlands on private property. It provides an opportunity for landowners to receive financial incentives to restore or enhance wetlands on their property. Landowners can enroll in the WRP by one of the following three means:

- Permanent Easement. USDA will pay the lowest of the following three amounts: (1) the agricultural value of the land, (2) an established payment cap, or (3) an amount offered by the landowner. In addition, the USDA pays 100 percent of the cost of restoring wetlands and seeding of upland areas into native grasses and forbs.

- 30-Year Easement. USDA will pay 75 percent of the appraised market value for the land and 75 percent of the cost associated with wetland restorations and upland native grass seeding.

- Restoration Cost-Share Agreement. USDA will pay 75 percent of the cost of restoring a wetland in exchange for a minimum ten-year agreement to maintain the restoration. No land use payment is provided.

Any type of land that can be restored to a wetland at a reasonable cost is eligible for WRP, except for wetlands drained in violation of Swampbuster or land established to trees under the Conservation Reserve Program. Cost-share is available to restore:

- Wetlands cleared and/or drained for farming, pasture, or timber production;

- Upland areas around a restored wetland and;

- Drained wooded wetlands where hydrology will be restored.

The WRP program is administered by the NRCS, with assistance from local soil and water conservation districts.

Reinvest in Minnesota Reserve Program (Perpetual)

The Reinvest in Minnesota (RIM) Reserve Program, administered by local SWCDs and the BWSR, was one of the first State programs of its kind in the nation. RIM allows landowners to sell perpetual easements for riparian lands, sensitive groundwater areas, wetland restoration areas (drained wetlands), marginal cropland, and land for living snowfences. The payment rate for the program is based on 90 percent of the average market value of tillable land in the township. In addition, RIM Reserve provides cost share funds, often 100 percent, for the establishment of appropriate conservation and wildlife habitat practices on easement lands.

Since its beginning in 1986, funding for the program has been erratic, ranging from a high of $51 million, to a low of $3 million. Since it began, RIM Reserve has enrolled approximately 3,927 easements, covering 126,567 acres, including 43,401 acres of wetland restoration and adjacent upland. The program has historically fostered partnerships with private organizations, including Pheasants Forever, Ducks Unlimited, and the Minnesota Waterfowl Association, as well as other government agencies, including the USFWS and the Minnesota DNR. As of September 2006, the BWSR reported 3 RIM contracts in the District, totaling 114 acres.

U.S. Fish and Wildlife Service Easements (Perpetual)

The USFWS manages land enrolled in two types of conservation easement programs in the District: the Farmer's Home Administration (FmHA) Program and Wetland Easement Program. Under the first program, when a landowner defaults on an FmHA loan, and that property contains wetlands, those wetlands receive protection. Protection may come in the form of a perpetual conservation easement or fee title transfer to a Federal or State fish and wildlife agency for management. As of September 2006, there were 114 acres of land in the FmHA Program in the District.

The Wetland Easement Program provides landowners an opportunity to permanently protect existing wetlands through a perpetual easement. Wetlands that are enrolled in this program cannot be drained, filled, leveled, or burned. Landowners retain both hunting and mineral rights and can graze or hay wetland when they naturally dry up. As of September 2006, there were a total of 5,138 acres enrolled in the Wetland Easement Program in the District.

Restorable Wetlands Inventory

In October 2000, a Restorable Wetlands Working Group was formed to create a Restorable Wetland Inventory (RWI) for the glaciated tallgrass Prairie Pothole Region of Minnesota and Iowa. This group represents a unique partnership between several governmental agencies and private conservation groups including the USFWS, NRCS, USACE, BWSR, DNR, MPCA, MnDOT, Ducks Unlimited, Red River Basin Institute, Pheasants Forever, and the Nature Conservancy. The collective goal of this group is to develop inventories that can be used to prioritize areas for wetland restoration.

Several data sources were used in the wetland delineation process including National Aerial Photography Program (1:40,000 scale) color infrared photographs acquired in 1991 and 1992, USGS 7.5 min topographic quadrangle maps, National Wetlands Inventory (NWI) maps, county soil survey maps, and USDA Farm Service Agency compliance slides acquired in 1993 (immediately after a period of intense precipitation). Specific photointerpretation protocols included:

1. All drained depressional wetlands, regardless of size, were delineated.

2. NWI wetlands were delineated if the original delineation did not include the entire historic wetland area.

3. Wetlands identified on NWI maps which did not exhibit wetland characteristics (i.e. hydrology, hydrophytes, etc) on new (1992) CIR photography were delineated even if no evidence of drainage was apparent.

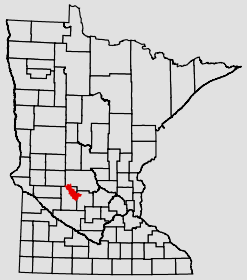
4. Wetlands not delineated on NWI maps, and in cropland, were delineated.

5. Wetlands not delineated on NWI maps, and in grassland, were not delineated, unless evidence of drainage was observed on the aerial photo.

6. Wetlands not delineated on NWI maps, and in trees, were not delineated.

To date, an RWI inventory has been completed for 17 counties in Minnesota, including Kandiyohi, Pope, and Stearns. The location of restorable wetlands in these areas is shown in Map 2B. A breakdown of restorable wetlands per subwatershed is provided in Table 2F.

MAP 2B: RESTORABLE WETLANDS INVENTORY MIDDLE FORK CROW RIVER WATERSHED DISTRICT



Map Created By:
Mid-Minnesota
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Willmar, MN 56201
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Pope
Brooten
Stearns
Belgrade
Crow Lake
Regal
Kandiyohi
Paynesville
Monongalia Lake
Long Lake
New London
Nest Lake
Green Lake
Calhoun Lake
Spicer
Diamond Lake
Meeker
Kandiyohi
Grove City
Atwater

Legend

- Restorable Wetland Inventory
- Middle Fork Crow River
- Major Roads
- Major Lakes
- Municipalities
- Legal Boundary
- Major Subwatersheds
- County Boundary

Major Subwatersheds

1. Judicial Ditch 3 Main Stem
2. Judicial Ditch 3 Branch 6 (CD B6)
3. Kandiyohi County Ditch No. 37
4. Monogalia Lake (Mud Lake)
5. Nest Lake
6. Green Lake
7. Lake Calhoun
8. Diamond Lake
9. Meeker County Ditch No. 47
10. Middle Fork Crow River

0 1 2 3 Miles

Table 2F
Restorable Wetlands by Subwatershed

Subwatershed	Restorable Wetlands	
	Number	Area (ac)
Diamond Lake	2,373	3,350
Calhoun Lake	1,524	1,508
Judicial Ditch 3, Mainstem	1,316	1,802
Kandiyohi County Ditch 37	1,025	3,148
Monongalia Lake	968	1,250
Meeker County Ditch 47	908	925
Judicial Ditch 3, Branch 6	786	1,529
Green Lake	598	627
Nest Lake	411	631
Middle Fork of the Crow River	144	191
District Total	*10,053*	*14,961*

As expected, the predominately agricultural areas of the District offer the most restorable wetlands. The Diamond Lake subwatershed has the most restorable wetlands, with 2,373, totaling 3,350 acres. It is important to note that these figures do not include the Meeker County portion of the District; this inventory will be completed in 2007. Given the high percentage of cultivated agricultural land in the Meeker County Ditch 47 (85%) and Middle Fork of the Crow River (87%) subwatersheds, it is likely that these areas will equal or surpass the Diamond Lake subwatershed totals.

Invasive Aquatic Plant Species

The two most prevalent non-native, invasive aquatic species present in the District are Eurasian watermilfoil (Myriophyllum spicatum) and curlyleaf pondweed (Potamogeton crispus). While only a few lakes are currently infested with these species, the possibility does exist that they will be transferred to other water resources. Currently, the only waterbody infested with milfoil is Green Lake. Curlyleaf pondweed is a noted problem in Diamond and Nest Lakes. The following provides a profile of each of these invasive species.

Eurasian watermilfoil

Eurasian watermilfoil is an aquatic plant that was accidentally introduced to North America from Europe over a century ago. It was first discovered in Minnesota in 1987 and is now known to infest approximately 160 lakes and streams statewide, including Green Lake. Eurasian watermilfoil typically has 12 to 21 pairs of leaflets, making it readily distinguishable from the native northern watermilfoil, which usually has 5 to 9 pairs.

In some lakes, milfoil coexists with native plants and does not cause problems. However, in shallow, nutrient-rich lakes, the plant often forms thick underwater stands of tangled stems and vast mats of vegetation at the water's surface. When this occurs, milfoil can interfere with water-based recreational activities such as boating, fishing, and swimming. The plant's floating canopy can also crowd out important native aquatic plants.

The reproductive characteristics of milfoil make it a formidable invasive plant. Eurasian watermilfoil reproduces through stem fragmentation and runners. A single segment of stem and leaves can take root and form a new colony. Fragments clinging to boats and trailers can spread the plant from lake to lake. The mechanical clearing of aquatic plants for beaches, docks, and landings can create thousands of new stem fragments. Removal of native vegetation creates perfect habitat for invading Eurasian watermilfoil.

Water resources infested with Eurasian watermilfoil are included on the DNR's Infested Water List, which is updated annually, in accordance to Minnesota Rules, part 6216.0350. Activities associated with waters included on this list are subject to Minnesota Rules, parts 6216.0100 to 6216.0600, Minnesota Statutes, section 84D.13, and other applicable laws. As part of these regulations, the DNR is required to post signage of the presence of milfoil at all public water accesses of infested waters.

Once Eurasian watermilfoil is discovered in a lake, the DNR conducts a survey to determine the distribution and abundance of the plant. This assessment is used to develop a management approach for that lake. Generally, if the milfoil occupies less than 10 acres and control is planned, it is classified as a limited infestation. The area with milfoil is marked with yellow milfoil buoys and entry into the area is prohibited in an attempt to minimize the spread of milfoil. On lakes where milfoil is already established in more than 10 acres, milfoil buoys may be used to mark infested areas; however, there is no legal prohibition on entry into the marked area.

Control of milfoil is commonly accomplished by mechanical removal of plants or treatment with herbicides, which may include 2,4-D and various contact herbicides, such as diquat or endothall products. Generally, these methods provide relief during the year of treatment, but little, if any, residual relief into the following year. Since 1992, the State has funded research into potential insect biological control agents for watermilfoil. Work has been primarily focused on a weevil (Euhrychiopsis lecontei), which is a native insect. The results of this approach have been mixed. The weevil has successfully controlled milfoil in some lakes, but not in others. Current research is focused on determining what factors or conditions limit the abundance of weevils and prevent the insects from controlling milfoil.

Overall, the DNR supports management strategies that cause as little damage to native aquatic plants as possible. The widespread destruction of native plants can lead to an overall increase in the amount of Eurasian watermilfoil in a water body because it is very effective at invading disturbed habitat. Based upon past experience, the DNR believes that eradication of Eurasian watermilfoil is not a realistic goal.

Curlyleaf Pondweed

Curlyleaf pondweed is a non-native, aquatic plant that was introduced to North America from Eurasia in the late 1800's. It was first discovered in Minnesota about 1910 and has since been documented in 540 lakes statewide. Curlyleaf pondweed is similar in appearance to many native pondweeds found in Minnesota lakes and streams, with 2 to 3 inch leaves that are somewhat stiff and crinkled. However, it can be easily distinguished from other species by its unique life cycle; it is generally the first pondweed to come up in the spring and dies back mid-summer.

In some lakes, curlyleaf coexists with native plants and does not cause problems. In other lakes, it becomes the dominant plant and causes significant problems. The two main problems associated with curlyleaf pondweed are: 1) the formation of dense mats in late spring and early summer which

may interfere with recreation and limit the growth of native aquatic plants, and 2) the mid-summer dieback and subsequent decomposition of the plant contributes phosphorus to the lake. Like other aquatic vegetation, the abundance of curlyleaf varies from year to year depending on environmental conditions, such as winter snow depth and water clarity.

Curlyleaf pondweed's unique life cycle gives it competitive advantages over many native aquatic plants. Unlike most native plants, curlyleaf remains alive during the winter months, slowly growing even under thick ice and snow cover. Therefore, it is often the first plant to appear after ice-out. In midsummer, when most aquatic plants are growing, curlyleaf plants are dying back. Before they die, they form vegetative propagules called turions (hardened stem tips) that disperse by water movement. Turions lay dormant during the summer when native plants are growing, and most germinate in the fall when most native vegetation has died back. Long-term management of curlyleaf will require the reduction or elimination of turions to interrupt its life cycle.

The two main challenges associated with the management of curlyleaf are to minimize damage to native plants and to produce long-term control. Curlyleaf can be managed using mechanical methods, herbicides, and habitat manipulation. Since curlyleaf is generally gone by mid-July, management activities should be undertaken in spring or very early summer to have the maximum benefit.

Mechanical control includes raking, cutting or harvesting vegetation. Raking and hand cutting generally remove the plants at the sediment surface, while harvesting generally removes the top five feet of the plants. Mechanical methods control plants in the specific areas where they are causing a nuisance, and there is immediate relief from the nuisance. There is some evidence that early season cutting of curlyleaf at the sediment surface can prevent turion production.

There are a small number of aquatic herbicides that can be used to control curlyleaf pondweed. Good to excellent control of curlyleaf can be obtained using formulations of diquat (e.g., Reward) and endothall (e.g., Aquathol, K). Nevertheless, these herbicides only give control in the year of treatment. There is some evidence that use of endothall- based herbicides in early spring can control curlyleaf and stop turion production.

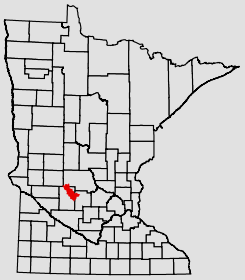
Habitat manipulations, such as water level drawdown and dredging, can also be used to manage curlyleaf pondweed. Fall drawdown can kill curlyleaf pondweed turions by exposing them to freezing temperatures and desiccation. Dredging can be used to control curlyleaf by increasing water depth. In deep water, rooted plants do not receive enough light to survive. Depending upon how much material is removed, dredging can prevent all rooted macrophytes from growing for many years. Dredging and drawdown projects require special permits and coordination among lake managers, lake users, and MnDNR Divisions of Fisheries, Wildlife, and Waters, because these projects can have significant negative effects on fisheries and lake use.

Other Species

There are several other non-native, aquatic species of lesser prominence that pose a threat to water resources of the District. Among these species include purple loosestrife, flowering rush, yellow iris, zebra mussels, and common carp. The DNR is primarily addressing concerns related to these species through educational programs. These programs are primarily targeted to boaters and landowners.

MAP 2C:
EROSION SUSCEPTIBILITY

MIDDLE FORK CROW RIVER WATERSHED DISTRICT



Map Created By:
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Pope
Brooten
Stearns
Belgrade
Crow Lake
Regal
Kandiyohi
Paynesville
Monongalia Lake
Long Lake
New London
Calhoun Lake
Nest Lake
Green Lake
Spicer
Diamond Lake
Meeker
Kandiyohi
Grove City
Atwater

Legend

- Middle Fork Crow River
- Major Roads
- Major Lakes
- Municipalities
- Legal Boundary
- Major Subwatersheds
- County Boundary

Erosion Susceptibility

- Highly erodible land
- Potentially highly erodible land
- Not highly erodible land
- Water Body

Major Subwatersheds

1. Judicial Ditch 3 Main Stem
2. Judicial Ditch 3 Branch 6 (CD B6)
3. Kandiyohi County Ditch No. 37
4. Monogalia Lake (Mud Lake)
5. Nest Lake
6. Green Lake
7. Lake Calhoun
8. Diamond Lake
9. Meeker County Ditch No. 47
10. Middle Fork Crow River

0 1 2 3 Miles

Eurasian Watermilfoil and Aquatic Plant Management Plan for Green Lake

In April 2003, a Eurasian Watermilfoil and Aquatic Plant Management Plan was prepared for Green Lake by Steve McComas of Blue Water Science and Dick Osgood of The Osgood Group. The Green Lake Property Owners Association and Kandiyohi County Department of Environmental Services sponsored the plan, which was funded through a $3,000 grant awarded by the DNR. The plan provides an analysis of aquatic plant surveys, watershed land use, water quality data, fisheries surveys, and lake sediment fertility. Overall, Eurasian watermilfoil was documented at 4% (2/50) of points sampled in October and November 2001, mainly on the south side of the Lake. The infestation was described as "limited"; however, "its potential for spreading has probably not been fully realized". The plan also identifies potential strategies for managing Eurasian watermilfoil, with the overall goal of limiting its ecological impacts. It is important to note that this is not an official Lake Vegetation Management Plan, which is typically developed by the DNR, Division of Fisheries.

B. Land Resources

Erodible Soils

The distribution of erosion-prone soils within the District is shown in Map 2C. Notice that the vast majority of these soils are found in the New London-Spicer Area, particularly along the Alexandria Moraine. This area is also experiencing the heaviest development pressure in the District. Overall, nearly 16% of the District's soils are classified as either highly erodible or potentially highly erodible. The principal factors that influence soil erodibility are soil texture and slope. Protecting erodible soils will be critical in preserving and improving the quality of water resources in the District.

Land Use

Over the next ten years, land usage within the District is expected to remain relatively constant. The most significant changes are expected to occur in the farmstead and rural residential and urban and industrial categories. These land uses are expected to increase to accommodate projected growth in the District, particularly in the New London-Spicer Area. The percentage of cultivated agricultural land within the District could potentially decrease as a result of increased development and additional land being enrolled in conservation programs, such as Conservation Reserve Program (CRP) and Reinvest in Minnesota (RIM) Reserve.

Population and Household Projections

Population and household projections (2000-2030) for cities and counties within the District are given in Table 2G. Population projections were provided by the Minnesota State Demographic Center. Household projections were calculated by dividing the population figures of each city and county by their respective persons per household ratio from the 2000 U.S. Census. Because of the complex interaction of factors that drive population and household growth and loss, such as births, deaths, migration, and immigration, the projections provided should only be viewed as realistic estimates of what could occur in the District in the future.

Each of the cities and two counties within the District are expected to experience varying levels of population and household growth over the next 23 years. The cities of New London and Spicer, along with Kandiyohi County, are expected to experience the largest net gains in population and households. The recent expansion of Highway 23 from a two-lane to a four-lane will undoubtedly

foster future growth in the New London-Spicer Area. Regardless of the exact amount of future growth in these areas, proper planning will be essential in preserving the water resources of the District.

Table 2G
Population and Household Projections for Cities and Counties (2000-2030)

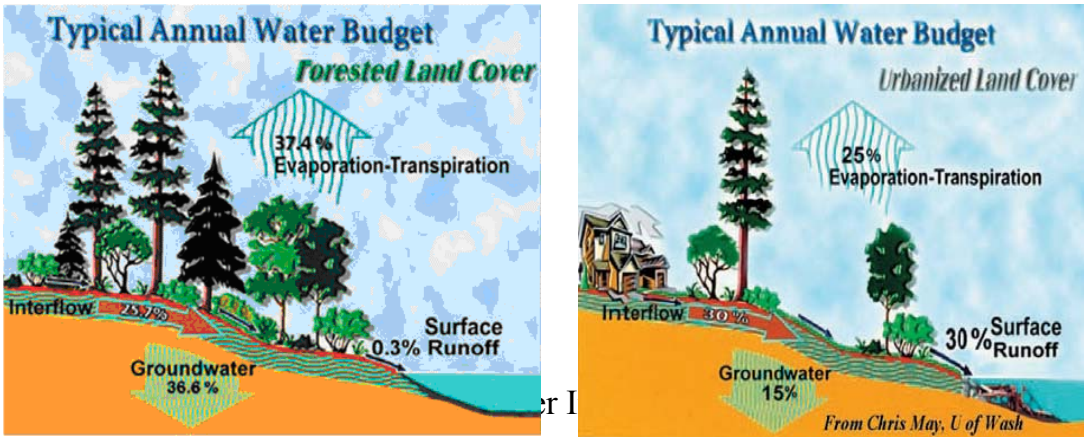
POPULATION City/County	Projection Interval							Change	
	2000	2005	2010	2015	2020	2025	2030	Number	Percent
Atwater	1,079	1,089	1,098	1,105	1,113	1,118	1,121	42	3.9
Belgrade	750	739	752	766	780	795	812	62	8.3
New London	1,066	1,105	1,143	1,181	1,214	1,241	1,263	197	18.5
Spicer	1,126	1,174	1,219	1,263	1,304	1,337	1,363	237	21.0
Kandiyohi County	6,150	6,562	6,949	7,338	7,703	8,021	8,300	2,150	35.0
Meeker County	585	589	594	597	601	602	602	17	2.9
Pope County	6	6	5	5	5	5	5	-1	-16.7
Stearns County	295	282	272	265	259	254	248	-47	-15.9
District Total	*11,057*	*11,546*	*12,032*	*12,520*	*12,979*	*13,373*	*13,714*	*2,657*	*24.0*
HOUSEHOLDS City/County	**Projection Interval**							**Change**	
	2000	**2005**	**2010**	**2015**	**2020**	**2025**	**2030**	**Number**	**Percent**
Atwater	467	471	475	478	482	484	485	18	3.9
Belgrade	342	337	343	350	356	363	371	29	8.5
New London	461	478	495	511	526	537	547	86	18.7
Spicer	529	551	572	593	612	628	640	111	21.0
Kandiyohi County	2,337	2,494	2,641	2,789	2,929	3,050	3,156	819	35.0
Meeker County	200	202	203	205	206	206	206	6	3.0
Pope County	2	2	2	2	2	2	2	0	0.0
Stearns County	102	98	95	92	90	88	86	-16	-15.7
District Total	*4,440*	*4,633*	*4,826*	*5,020*	*5,203*	*5,358*	*5,493*	*1,053*	*23.7*

Land Use Issues

Stormwater Management

Stormwater is an all-inclusive term that refers to water running off of the land surface after a rainfall or snowmelt event. Prior to development, stormwater represents only a small component of the annual water balance. However, as development increases, natural surfaces are replaced with impervious surfaces including roads, driveways, parking lots, and rooftops. The impact of low urbanization on a typical annual water budget is shown in Figure 2D. Notice that runoff increases substantially from the natural (0.3%) to developed (30%) state. In addition, development results in a decrease in groundwater infiltration and an increase in evaporation-transpiration.

Figure 2D
The Effects of Development on the Annual Water Budget



Source: University of Washington

According to the *Center for Watershed Protection*, when the level of impervious coverage in a watershed increases to between 10 and 30%, several stormwater-related impacts are realized. These consequences include changes to stream flow, changes to stream geomorphology, aquatic habitat impacts, and water quality impacts. The following provides a detailed description of each of these impacts, as derived from the *2005 Minnesota Stormwater Manual*.

Changes to Stream Flow:

- *Increased Runoff Volumes* - Land surface changes can dramatically increase the total volume of runoff generated in a developed watershed through compaction of soils and introduction of impervious surfaces.

- *Increased Peak Runoff Discharges* - Rainfall quickly runs off impervious surfaces instead of being released gradually as in more natural landscapes. Increased peak discharges for a developed watershed can be two to five times higher than those for an undisturbed watershed. Control programs that may address runoff rates do not fully address many of the problems associated with stormwater runoff.

- *Greater Runoff Velocities* - Impervious surfaces and compacted soils, as well as improvements to the drainage system such as storm drains, pipes, and ditches, increase the speed at which rainfall runs off land surfaces within a watershed.

- *Shorter Times of Concentration* - As runoff velocities increase, it takes less time for water to run off the land and reach a stream or other waterbody.

- *Increased Frequency of Bank-full and Near Bank-full Events* - Increased runoff volumes and peak flows increase the frequency and duration of smaller bank-full and near bank-full events, which are the primary channel forming events.

- *Increased Flooding* - Increased runoff volumes and peaks also increase the frequency, duration and severity of out-of-bank flooding.

- *Lower Dry Weather Flows (Baseflow)* - Reduced infiltration of stormwater runoff could cause streams to have less baseflow through shallow ground water inflow during dry weather periods and reduces the amount of rainfall recharging ground water aquifers.

Changes to Stream Geomorphology:

- *Stream Widening and Bank Erosion* - Stream channels widen to accommodate and convey the increased runoff and higher stream flows from developed areas. More frequent small and moderate runoff events undercut and scour the lower parts of the streambank, causing the steeper banks to slump and collapse during larger storms.

- *Higher Flow Velocities* - Increased streambank erosion rates can cause a stream to widen many times its original size due to post-development runoff.

- *Stream Downcutting* - Another way that streams accommodate higher flows is by downcutting their streambed. This causes instability in the stream profile, or elevation along a stream's flow path, which increases velocity and triggers further channel erosion both upstream and downstream.

- *Loss of Riparian Canopy* - As streambanks are gradually undercut and slump into the channel, the vegetation (trees, shrubs, herbaceous plants) that had protected the banks are exposed at the roots. This leaves them more likely to be uprooted or eroded during major storms, further weakening bank structure.

- *Changes in the Channel Bed Due to Sedimentation* - Due to channel erosion and other sources upstream, sediments are deposited in the stream as sandbars and other features, covering the channel bed, or substrate, with shifting deposits of mud, silt and sand.

- *Increase in the Floodplain Elevation* - To accommodate the higher peak flow rate, a stream's floodplain elevation typically increases following development in a watershed due to higher peak flows. This problem is compounded by building and filling in floodplain areas, which cause flood heights to rise even further. Property and structures that had not previously been subject to flooding may now be at risk.

Aquatic Habitat Impacts:

- *Degradation of Habitat Structure* - Higher and faster flows due to development can scour channels and wash away entire biological communities. Streambank erosion and the loss of riparian vegetation reduce habitat for many fish species and other aquatic life, while sediment deposits can smother bottom-dwelling organisms and aquatic habitat.

- *Loss of Pool-Riffle Structure* - Streams draining undeveloped watersheds often contain pools of deeper, more slowly flowing water that alternate with "riffles" or shoals of shallower, faster flowing water. These pools and riffles provide valuable habitat for fish and aquatic insects. As a result of the increased flows and sediment loads from urban watersheds, the pools and riffles disappear and are replaced with more uniform, and often shallower, streambeds that provide less varied aquatic habitat.

- *Reduced Baseflows* - Reduced baseflows possibly due to increased impervious cover in a watershed and the loss of rainfall infiltration into the soil and water table adversely affect instream habitats, especially during periods of drought.

- *Increased Stream Temperature* - Runoff from warm impervious areas (e.g.. streets and parking lots), storage in impoundments, loss of riparian vegetation and shallow channels can all cause an increase in temperature in urban streams. Increased temperatures can reduce dissolved oxygen levels and disrupt the food chain. Certain aquatic species, such as trout, can only survive within a narrow temperature range.

- *Decline in Abundance and Biodiversity* - When there is a reduction in various habitats and habitat quality, both the number and the variety, or diversity, of organisms (e.g.. wetland plants, fish, and macroinvertebrates) are also reduced. Sensitive species and other life forms disappear and are replaced by those organisms that are better adapted to the poorer conditions. The diversity and composition of the benthic, or streambed, community have frequently been used to evaluate the quality of urban streams. Aquatic insects are a useful environmental indicator as they form the base of the stream food chain. Fish and other aquatic organisms are impacted not only by the habitat changes brought on by increased stormwater runoff quantity, but are often also adversely affected by water quality changes due to development and resultant land use activities in a watershed.

Water Quality Impacts:

- *Increased Total Dissolved Solids* - Suspended solids include inorganic (sediment, sand) and organic (vegetative and animal waste) particulates. Among the problems that suspended solids cause in receiving waters are turbidity (cloudiness), increased water temperature, destruction of the aquatic habitat (burying, alteration of bottom material), transport of adsorbed contaminants, clogging of drainage systems, and direct impact on aquatic organisms (altered respiration, reduced light penetration). Sources of particulates include streambed and streambank erosion, runoff from construction sites, vegetative debris, and litter.

- *Increased Nitrogen and Phosphorus* - High concentrations of these nutrients can result in algal blooms and excessive aquatic plant growth. Of the two, phosphorus is usually the limiting nutrient that controls the growth of algae in lakes. As phosphorus loading increases, the potential for algal blooms and accelerated lake eutrophication also increases. Sources of these nutrients include organic matter and fertilizers applied improperly or in excessive amounts.

- *Decreased Dissolved Oxygen* - As aerobic microorganisms decompose organic matter, dissolved oxygen is consumed. Following a rainfall event, runoff can deposit large quantities of oxygen-demanding substances, including animal waste and street litter, in lakes or streams. A "pulse" of high oxygen demand may then occur which depletes dissolved oxygen supplies, especially in shallow, slow-moving waters. Oxygen depletion is a common cause of fish kills.

- *Increased Chloride* - In Minnesota, a tremendous amount of salt is used each year to melt ice from roads, parking lots, and sidewalks. Because it is extremely soluble, almost all salt applied ends up in surface or ground water (Pitt *et al*., 1994a). If the concentration of chloride becomes too high, it can be toxic to many freshwater organisms. Normal application of de-icing salt to roads is unlikely to create toxic conditions. However, there have been many documented cases of surface and ground water contamination caused by runoff from inadequately protected stockpiles of salt and sand-salt mixtures.

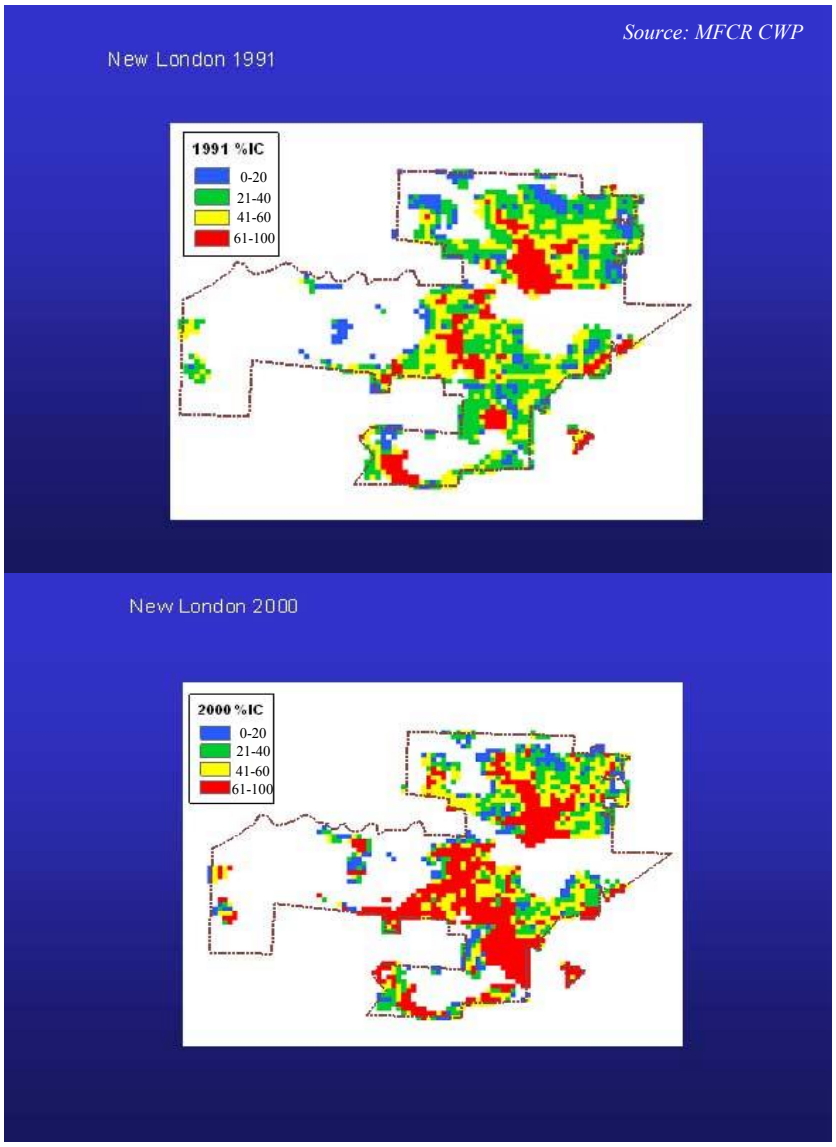
- *Increased Pathogens* - High levels of bacteria and viruses are commonly found in stormwater runoff. While not all of these pathogens pose a threat to human health, several do, including E. coli and hepatitis A. Sources of pathogens include sanitary sewer leaks, animal waste, and discarded infected material.

Impervious Surface Studies

<u>New London and Spicer Study</u>

In 2004, the University of Minnesota's Remote Sensing and Geospatial Laboratory, under contract with the MPCA, developed impervious surface maps for Spicer and New London using available Landsat satellite remote sensing data. Maps from 1990 and 2000 were prepared for each city for comparison purposes. Over the decade, New London's impervious surface coverage increased from 22.4% to 28.5%. By comparison, Spicer's impervious surface coverage increased from 23.2% to 35.7% over the same timeframe. The study concluded that the amount of impervious coverage could cause irreversible degradation of streams, if measures are not taken to reduce the rates of stormwater runoff. Figure 2E provides examples of the impervious surface maps that were prepared for New London.

Figure 2E
Estimated Impervious Coverage for the City of New London (1991 and 2000)



Green Lake Study

In 2005, the DNR, Division of Waters-Spicer Office conducted an impervious surface inventory on the first tier of development around Green Lake. The inventory focused on the area inside of the road that encircles the lake. This area represents an approximately 300-foot zone adjacent to the lakeshore that is characterized by high levels of development on substandard lots. Impervious surfaces, including structures, driveways, roads, and parking areas, were identified and digitized using 2003 FSA digital orthophotography. Based on these aerial photographs, an estimated 29% of the 406 acres of land located inside of the lake road was determined to be impervious (including the roadway). Residential development (48%) and roads (46%) account for a majority of the imperviousness. A map of these impervious surface is shown in Figure 2F.

Figure 2F
Green Lake Impervious Surface Coverage Map

Minnesota Stormwater Program

The Stormwater Program is a comprehensive program that is administered by the MPCA, with oversight from the EPA. The program is based upon the Federal Clean Water Act requirements for addressing polluted stormwater runoff. A 1987 amendment to the Federal Clean Water Act required implementation of a two-phase comprehensive national program to address stormwater runoff. Since the early 1990s, Phase I regulated large construction sites, 10 categories of industrial facilities, and major metropolitan MS4s, including Minneapolis and St. Paul.

On March 10, 2003 the program broadened to include smaller construction sites, municipally owned or operated industrial activity, and many more municipalities. Phase II is designed to further reduce adverse impacts to water quality and puts controls on runoff that have the greatest likelihood of causing continued environmental degradation.

Stormwater regulations are part of the National Pollutant Discharge Elimination System (NPDES) permit program. The EPA delegated permitting authority for Minnesota's NPDES program to the MPCA in 1974. The MPCA issues combined State Disposal System (SDS) and NPDES stormwater permits. There are three general permit types: construction, industrial, and municipal. An overview of the requirements of each permit type is provided below.

Construction Permits

Under Phase I, operators of large construction activity, resulting in the disturbance of five or more acres of land, were required to obtain general permit coverage. Some activities requiring permit included clearing, grading, excavating, road building, construction of houses and office buildings, landfills, airports, feedlots, and industrial or commercial buildings.

Phase II was expanded to include small construction activity that results in the disturbance of equal to or greater than one acre and less than five acres. Like the Phase I program, owners and operators of small construction sites need to obtain permit coverage and implement practices to minimize pollutant runoff from construction sites.

Industrial Permits

Under Phase I, facilities with Standard Industrial Classification codes in 10 categories were regulated. They were identified as either mandatory (issued a permit with no exceptions) or discretionary facilities (may or may not be issued a permit). Some discretionary facilities whose industrial materials or activities were not exposed to stormwater were not required to obtain permit coverage.

Under Phase II, the mandatory and discretionary classifications were deleted and facilities with no materials or activities exposed to stormwater were not required to obtain permit coverage. No new categories of industrial activity were added to the program. However, since March 10, 2003 many small municipalities (populations of less than 100,000) that had previously been exempted had to obtain permit coverage for their industrial activity.

Municipal Permits

Under Phase I, Minneapolis and St. Paul obtained individual permits and designed and implemented stormwater programs. Revised stormwater rules require cities to obtain permit coverage by Feb. 15, 2007 if their population exceeds 10,000 (or 5,000 if they're located within ½ mile of an outstanding value resource water or impaired water).

Common Compliance Problems

The following provide a listing of compliance problems are commonly found at small construction sites, as derived from the *MPCA Stormwater Construction Inspection Guide*.

Problem #1 - No Temporary or Permanent Cover. Continuous positive slopes with exposed soil and within 200 linear feet of a surface water must have temporary erosion protection or permanent cover year round. The timing of cover application depends on the steepness of the slope and when the slope was last worked. Ask the contractor when particular exposed slopes were last worked to help you determine if there is compliance.

Problem #2 - No Sediment Controls On-site. The permit requires established sediment control practices (e.g., sediment traps/ basins, down-gradient silt fences or sediment barriers, check dams, etc.) on down-gradient perimeters before up-gradient land disturbing activities begin.

Problem #3 - No Sediment Control for Temporary Stock Piles. Temporary stockpiles must have silt fence or other effective sediment controls, and cannot be placed in surface waters (or curb and gutter systems).

Problem #4 - No Inlet Protection. All storm drain inlets that receive a discharge from the construction site must be protected before construction begins, and must be maintained until the site is stabilized.

Problem #5 - No BMPs to Minimize Vehicle Tracking on to the Road. Vehicle exits must use BMPs such as stone pads, concrete, or steel wash racks, or equivalent systems to prevent vehicle tracking of sediment.

Problem #6 - Sediment on the Road. If BMPs are not adequately keeping sediment off the street, then the permit requires tracked sediment to be removed (e.g., street sweeping).

Problem #7 - Improper Solid Waste or Hazardous Materials Management. Solid waste must be disposed of properly, and hazardous materials (including oil, gasoline, and paint) must be properly stored (which includes secondary containment).

Problem #8 - Dewatering at the Construction Site. Typically dewatering occurs where building footings are being constructed. Have measure been taken to ensure that the pumped discharge is not causing erosion? Is the discharge turbid and if so is it treated before discharging from the site? Has ditching been used to dewater and if so is that water resulting in the discharge of sediment and causing water quality impairments?

Local Regulations

Each of the counties in the District has adopted stormwater management-related performance standards in their Zoning Ordinance. In addition, three of the cities in the District also address stormwater management in their zoning ordinance; only the City of Belgrade does not have any formal regulations. Both the Cities of Atwater and New London require stormwater management to be taken into consideration in the preparation of site plans. The City of Spicer has taken the initiative to adopt its own stormwater management ordinance, the only one of its type in the District. This ordinance requires a stormwater management plan for major land disturbing activities, such as subdivisions and commercial development. Overall, the standards of these local governmental units are inadequate to address current and future stormwater issues in the District.

Shoreland Management

The Minnesota Shoreland Management Act of 1969 was enacted to reduce the effect of uncontrolled and unplanned development on public waters, to maintain the economic value of shoreland property, and to preserve the intrinsic qualities of natural shoreland and waters. As a result of this legislation, Minnesota counties and specified cities are required to regulate land use and compatible development on public water shoreland through the adoption of a shoreland zoning ordinance, which contains State approved shoreland standards. In 1989, the DNR adopted its current statewide minimum shoreland standards, which apply to all lakes greater than 25 acres (10 acres in cities) and rivers with a drainage area two square miles or greater. These standards apply to the use and development of shoreland property including: sewage treatment, minimum lot size and water frontage, building setbacks and heights, land use, BMPs, and shoreland alterations. Specific standards vary by shoreland class. A description of each of the DNR lake and river shoreland classes is provided below.

Lake Classes

- ***Natural Environment Lakes*** usually have less than 150 total acres, less than 60 acres per mile of shoreline, and less than three dwellings per mile of shoreline.

- ***Recreational Development Lakes*** usually have between 60 and 225 acres of water per mile of shoreline, between 3 and 25 dwellings per mile of shoreline, and are more than 15 feet deep.

- ***General Development Lakes*** usually have more than 225 acres of water per mile of shoreline and 25 dwellings per mile of shoreline, and are more than 15 feet deep.

River Classes

- ***Remote Rivers*** are primarily in roadless, forested, sparsely populated areas in northeast Minnesota.

- ***Forested Rivers*** are in forested, sparsely to moderately populated areas with some roads in northeast, southwest, and north-central Minnesota.

- ***Transition Rivers*** are in a mixture of cultivated, pasture, and forested lands.

- ***Agriculture Rivers*** are in intensively cultivated areas, mainly southern and western areas of the state.

- ***Urban Rivers*** are in high-density residential, commercial, and industrial development areas.

- ***Tributary Rivers*** are all other rivers in the PWI not classified above.

Local Regulations

Each of the counties, along with the Cities of New London and Spicer, have adopted a shoreland management ordinance that meets the minimum standards set forth by the DNR. Meeker County has amended its ordinance to include a natural sensitive lakes classification which is intended to protect lakes that are especially vulnerable to the consequences of development. The shoreland classification of major lakes in the District is provided in Table 2H. With the exception of Monongalia and Woodcock, which are classified as Natural Environment, all of these lakes have a shoreland classification of General Development or Recreational Development. The River is classified as either an agriculture or transition river, depending on the segment.

Table 2H
Lake Shoreland Classification

Lake (DNR ID)		Shoreland Classification	OHWL
Calhoun	(34-0062)	Recreational Development	1,157.2
Diamond	(34-0044)	General Development	1,172.9
Elkhorn	(34-0119)	Recreational Development	1,168.1
George	(34-0142)	General Development	1,166.3
Green	(34-0079)	General Development	1,158.2
Long	(34-0066)	Recreational Development	1,209.8
Monongalia	(34-0158)	Natural Environment	1,203.4
Nest	(34-0154)	General Development	1,166.1
Woodcock	(34-0141)	Natural Environment	1,178.0

Wastewater Treatment

Sewage Treatment Facilities

There are three centralized sewage treatment facilities in the District. The Green Lake Sanitary Sewer and Water District (GLSSWD) is the largest of these facilities, serving the Cities of New London and Spicer and surrounding area. The Cities of Atwater and Belgrade each operate their own wastewater treatment facility. The following provides a profile of each of these facilities.

Green Lake Sanitary Sewer and Water District. The new GLSSWD wastewater treatment plant began operation in 2000. The plant was designed as an "extended aeration" biological treatment facility consisting of preliminary mechanical screening and grit removal, secondary biological treatment by means of aeration, final settling tanks, final filtration, and chlorination. Wastewater biosolids are treated to a Class "A" level, dewatered, and stored for use as a fertilizer supplement on agricultural land. The plant is designed to treat a peak hourly wet weather flow of 2.786 million gallons per day, an average wet weather flow of 889,000 gallons per day (324.5 million gallons per year). Design loadings are 850 lbs/day of CBOD and 1.125 lbs/day of TSS. The plant, located east of Green Lake, began receiving wastewater from the City of Spicer and the northwest side of Green Lake on August 14, 2000 with the City of New London being tied into the system later in August. The plant began discharging treated effluent into the River on August 18, 2000. All residences around Green Lake had become a part of the system by the fall of 2001.

The facility has been classified as a Class "A" facility requiring weekly testing to monitor plant operation and compliance with stream discharge standards. A Discharge Monitoring Report (DMR) is submitted monthly to the MPCA. The year 2001 was the first complete calendar year of operation. A total of 123.839 million gallons (380 acre-feet) of treated wastewater was discharged into the River during the year. Total phosphorus concentrations of the discharge ranged from 0.97 to 2.3 mg/l and the total amount of phosphorus exported during the year was 783.8 kg (1,728 pounds).

City of Atwater Sanitary Sewer System. The City of Atwater's system was constructed in 1970 and provides treatment via a three-cell lagoon system. The third cell in the system is a rapid infiltration basin, which is used to release treated effluent. As a condition of its NPDES permit, the City has installed several monitoring wells around the infiltration basin. The City samples these wells three times per year and the results are sent to the MPCA. To date, there have been no violations of State effluent standards. The system currently treats approximately 80,000 gallons/day (29.2 million gallons/year); this is less than half of its designed capacity. In the event of an emergency bypass, which occurs on the average of once every seven years, the system discharges to an area of land adjacent to the lagoon cells.

City of Belgrade Sanitary Sewer System. The City of Belgrade's system was originally constructed in 1964 and was upgraded in 1984. Wastewater treatment is provided via three lagoon cells. Spray irrigation is used to release treated effluent. To date, there have been no violations of the City's NPDES permit. Currently, the system is operating at approximately 60% of its designed capacity, which is 167,000 gallons/day (60.9 million gallons/year). In the event of the need for an emergency bypass, the system has the capability to discharge to the River. According to the City, this has occurred only once; a total of 5.5 million gallons was released between October 25-29, 1995.

Individual Sewage Treatment Systems

Individual Sewage Treatment Systems (ISTSs) are used for the treatment and disposal of wastewater from individual homes, clusters of homes, isolated communities, industries, or institutional facilities. When properly functioning, ISTSs are an effective means of treating wastewater. However, if improperly designed, installed, or maintained, ISTSs have the potential to adversely impact surface and groundwater resources. Human waste contains high concentrations of microorganisms and many chemicals including nitrogen, phosphorus, salts, and trace elements. These pollutants are a public health concern and can degrade the environment.

The first State law addressing failing ISTSs, known as the ISTS Act, went into effect in 1994. This legislation has since been codified as Minn. Rule Chapter 7080. Chapter 7080 requires that all new construction and replacement of ISTSs meet minimum statewide standards. It also systematically addresses the adequacy of existing systems through upgrading of failing systems before construction of an additional bedroom. The following are the State's objectives in regulating sewage systems through Chapter 7080.

- Keep inadequately treated sewage away from human contact to prevent disease
- Reduce levels of pathogenic bacteria and viruses discharged to the environment
- Reasonably and cost-effectively prevent groundwater contamination

- Develop clear direction for design, construction and maintenance of sewage treatment facilities
- Strive for cost effective methods of sewage treatment to maintain or improve property values
- Encourage personal responsibility for treating sewage

Under MN Statutes 115.55, which is cited below, counties are required to adopt an ISTS ordinance that complies with Chapter 7080. Counties are responsible for administering and enforcing their local ordinance. This includes assuring there is a permitting and inspection program. Local permits may be issued for new ISTS construction and replacement for systems with the capacity to treat up to 10,000 gallons per day.

> "**MN Statutes 155.55, Subd. 2. Local ordinances.** (a) All counties that did not adopt ordinances by May 7, 1994, or that do not have ordinances, must adopt ordinances that comply with individual sewage treatment system rules by January 1, 1999, unless all towns and cities in the county have adopted such ordinances. County ordinances must apply to all areas of the county other than cities or towns that have adopted ordinances that comply with this section and are as strict as the applicable county ordinances. Any ordinance adopted by a local unit of government before May 7, 1994, to regulate individual sewage treatment systems must be in compliance with the individual sewage treatment system rules by January 1, 1998."

Local Conditions

In an effort to assess current ISTS conditions within the District, a questionnaire (Table 2I) was developed and posed to each county's ISTS program contact. Each of the counties has adopted an ISTS ordinance that complies with Chapter 7080. In addition, each has amended their ordinance to require a Certificate of Compliance on all property transfers. Three counties reported more than 225 ISTS inspections per year. While this is an appreciable number, many systems are still not adequately treating sewage. In fact, between 20 and 75% of systems in these counties are believed to be failing. In each county, failing ISTSs are discovered through inspections and complaints.

Table 2I
County ISTS Questionnaire

Question	County			
	Kandiyohi	**Meeker**	**Pope**	**Stearns**
When was your County's ISTS ordinance last adopted/amended?	2005	1992	2000	1998
Is your County's ISTS ordinance compliant with MN Rules Ch. 7080?	Yes	Yes	Yes	Yes
Does your County's ISTS ordinance require a compliance inspection on all property transfers?	Yes	Yes	Yes	Yes
Approximately how many ISTSs are in your County?	6,600	4,000	3,500	30,000
Approximately how many ISTSs are inspected in your County per year?	275	225	100	300
Approximately what percentage of your County's ISTSs are deemed "failing"?	47%	20%	75%	20%
How are failing ISTSs discovered in your County?	Inspections Complaints	Inspections Complaints	Inspections Complaints	Inspections Complaints
Does your County have an ISTS inventory?	No	No	No	No

Feedlots

The MPCA regulates and controls pollution created by animal feedlots. The MPCA's feedlot rules were first adopted in 1971 and amended in 1974, 1978, and 2000. The trend in agriculture has been toward fewer but larger livestock and poultry facilities. There has also been an increasing awareness about the potential environmental effects of feedlots.

In accordance with the MPCA's feedlot regulations, the owner(s) of an animal feedlot or manure storage area with 50 or more animal units, or 10 or more animal units if in shoreland (less than 300 feet from a stream or river, or less than 1,000 feet from a lake) needed to register with the MPCA by January 1, 2002. Registration was accomplished through one of three means: 1) the owner(s) provided information on an MPCA registration form and returned it to the MPCA or, in a delegated county, the delegated county feedlot officer, 2) the owner(s) submitted a permit application (if required to obtain a permit), or 3) the owner(s) could have been listed on a current (as of October 1, 1997) Level II or Level III inventory that contained the required information and was submitted to the MPCA.

It is the owner's responsibility to ensure that his or her registration information has been forwarded to the MPCA. Registration information must be updated at least once in every four-year period after January 1, 2002. The MPCA or delegated county will notify owners that they must re-register at least 90 days before their current registration expires. Also, the MPCA or delegated county will send the owner a receipt within 30 days of receiving the registration information from the owner.

Once registered, owners are directed to obtain any needed permits. The requirement for a feedlot permit is dependant upon the size of the operation and whether a pollution hazard has been

identified. Owners with less than 300 animal units are not required to have a permit for the construction of a new facility or expansion of an existing facility if construction is in accordance with the technical standards contained in Minnesota State Rules. For owners with 300 animal units or more, but less than 1,000 animal units, a streamlined short-form construction permit is required for construction activities. An Interim Permit is required for owners with 300 animal units or more, but less than 1,000 animal units, if a pollution hazard has been identified. Finally, an NPDES permit or State Disposal System (SDS) permit is required for all feedlots with 1,000 animal units or more.

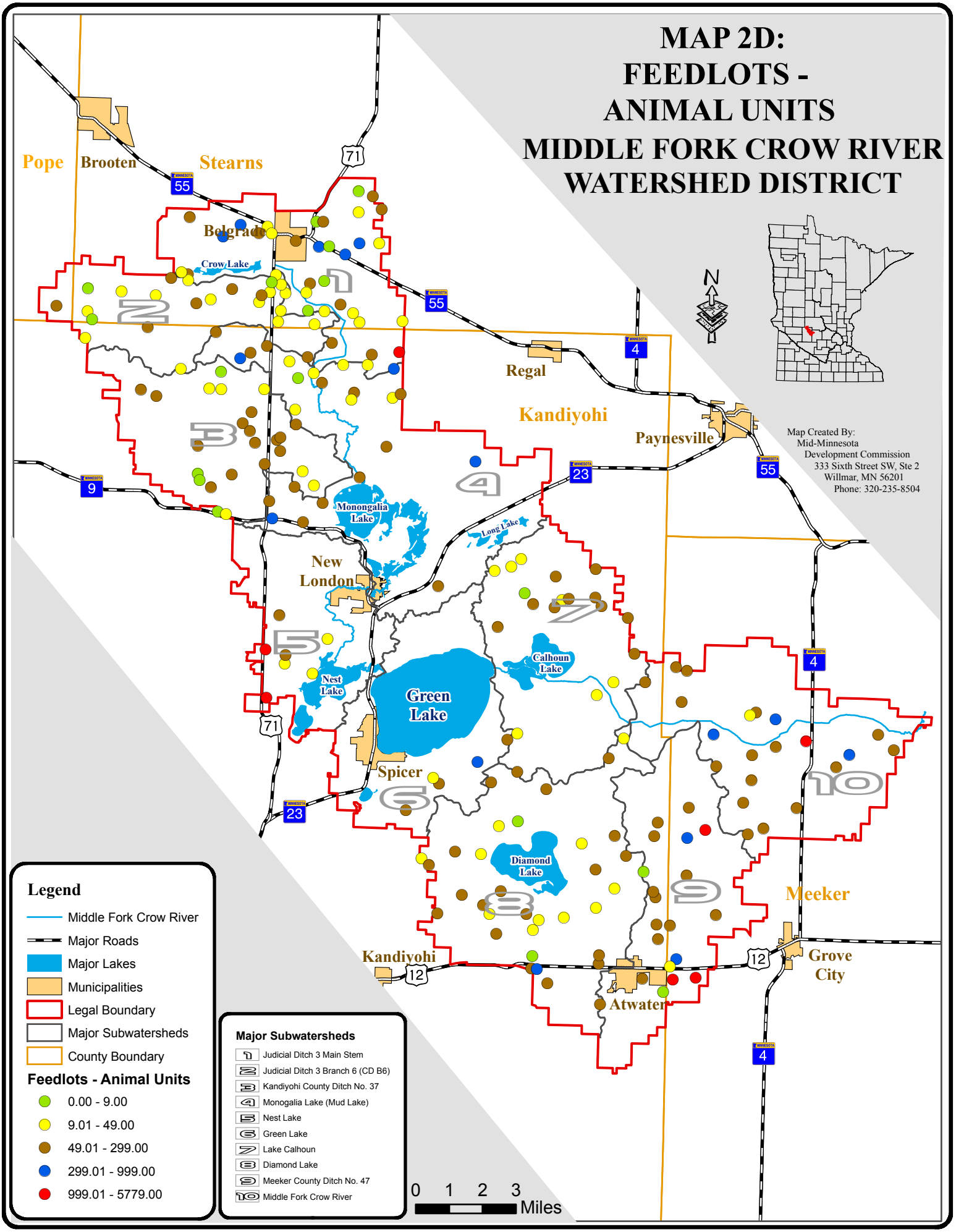
Owners of feedlots with less than 300 animal units, with passive manure-contaminated runoff from open lots, are encouraged to sign up for the 2005/2010 Open-lot Agreement. Under this agreement, the MPCA allows the owner to phase in necessary corrections to pollution problems. Owners are required to install clean-water diversions, vegetated buffer areas or filter strips for manure-contaminated runoff, or other corrective measures. Owners must meet the discharge standard of 25 mg/L BOD by October 1, 2010. One way owners can demonstrate compliance with these requirements is through a computer model ("An Evaluation System to Rate Feedlot Pollution Potential," more commonly known as FLEVAL) that achieves a 50 percent or more reduction in phosphorus and biochemical oxygen demand loading.

Local Conditions

The location of the 210 feedlots that are found within the District are displayed in Map 2D. There are a total of 42,916 animal units distributed amongst these feedlots. A questionnaire was also developed for each of the County Feedlots Officers. The results of this questionnaire are displayed in Table 2J.

Table 2J
County Feedlot Questionnaire

Question	County			
	Kandiyohi	**Meeker**	**Pope**	**Stearns**
When was your County's feedlot ordinance adopted/amended?	NA	2005	1999	2001
Is your County's feedlot ordinance compliant with MN Rules Ch. 7020?	NA	Yes	Yes	Yes
Approximately how many feedlots are in your County?	669	400	380	2,700
Is your County delegated to administer State feedlot rules?	Yes	Yes	Yes	Yes
What type of feedlot inventory has been conducted in your County?	Level II	Level I	Level I	Level II
What percentage of feedlots in your County are registered with the MPCA?	100%	90%	100%	98%
What percentage of your County's feedlots has had a walk through inspection?	100%	30%	70%	75%
How are feedlots that pose a pollution potential primarily identified?	Inspections	Inspections	Inspections	Inspections


MAP 2D:
FEEDLOTS -
ANIMAL UNITS
MIDDLE FORK CROW RIVER
WATERSHED DISTRICT
Pope
Brooten
Stearns
Belgrade
Crow Lake
Regal
Kandiyohi
Paynesville
Monongalia Lake
Long Lake
New London
Nest Lake
Green Lake
Calhoun Lake
Spicer
Diamond Lake
Meeker
Kandiyohi
Grove City
Atwater
Map Created By:
Mid-Minnesota
Development Commission
333 Sixth Street SW, Ste 2
Willmar, MN 56201
Phone: 320-235-8504
N
Legend
Middle Fork Crow River
Major Roads
Major Lakes
Municipalities
Legal Boundary
Major Subwatersheds
County Boundary
Feedlots - Animal Units
0.00 - 9.00
9.01 - 49.00
49.01 - 299.00
299.01 - 999.00
999.01 - 5779.00
Major Subwatersheds
1 Judicial Ditch 3 Main Stem
2 Judicial Ditch 3 Branch 6 (CD B6)
3 Kandiyohi County Ditch No. 37
4 Monogalia Lake (Mud Lake)
5 Nest Lake
6 Green Lake
7 Lake Calhoun
8 Diamond Lake
9 Meeker County Ditch No. 47
10 Middle Fork Crow River
0 1 2 3
Miles

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